DOCUMENT RESUME

ED 422 702 EC 306 679

AUTHOR	Swingler, Tim
TITLE	"That Was Me!": Applications of the Soundbeam MIDI Controller as a Key to Creative Communication, Learning, Independence and Joy.
PUB DATE	1998-03-00
NOTE	9p.; Paper presented at the California State University Northridge Conference on Technology and Persons with Disabilities (Los Angeles, CA, March 1998).
AVAILABLE FROM	World Wide Web: http://www.dinf.org/csun 98/csun98 163.htm
PUB TYPE	Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Audio Equipment; Basic Skills; Computer Uses in Education; Creative Development; *Educational Technology; *Electronics; Elementary Secondary Education; *Music Therapy; *Physical Disabilities; *Severe Disabilities; Sound Effects
IDENTIFIERS	Electronic Music; *Musical Instrument Digital interface

ABSTRACT

This paper describes the "Soundbeam MIDI (Musical Instrument Digital Interface) Controller," which allows even those students who have severe physical disabilities to create interesting aural and musical effects. Soundbeam works by emitting an invisible beam of high frequency sound inaudible to human ears. Even very slight interruptions of and movements within the beam change digital data about the beam's speed and direction. These data can be interpreted by a wide range of electronic musical instruments. The paper notes that this technology is being used in more than 1,000 special education and adult centers in over 20 countries and describes the development of the Soundbeam Project as a partnership between professionals in special education, music composition, electronics, and psychology. The paper explains the operation and performance of the equipment as well as a continuum of possible applications, ranging from the basics of cause-and-effect effect work and "sound therapy" to more ambitious creative/performance applications. Uses of the technology are seen as developing skills such as aesthetic awareness, imagination, listening skills, motor planning skills, memory skills, language skills, and social skills. (Contains 33 references.) (DB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☒ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY
T. SWINGER
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

ED 422 702

"That Was Me!": Applications of the Soundbeam" MIDI controller as a key to creative communication, learning, independence and joy.

Tim Swingler B.Sc. (hons), Cert Ed, DSA.
The Soundbeam Project
United Kingdom

Paper presented at the CSUN conference Technology and Persons with Disabilities', Los Angeles, March 1998

ABSTRACT

Recent advances in movement sensor and other technology have utilised various electronic media to create human - machine interfaces with apparently significant but largely unexplored educational potential. Such systems have often been conceived and developed for purposes outside the sphere of formal school education or therapy (e.g. performance art, dance, electroacoustic composition, VR environments, video animation), yet preliminary research demonstrates that it is the school environment in which such technology can contribute most dramatically; specifically to the educational experience of young children with severe disabilities who may have missed the foundation stones of early learning and for whom a first experience of enjoyable control and initiation can be a crucial educational motivator.

'Aesthetic resonation' is a term coined by Dr Phil Ellis to describe special moments experienced by individuals described as having profound and multiple learning difficulties, in which they achieve total control and expression in sound after a period of intense exploration, discovery and creation. Enjoyment and self-motivation are key aspects of this work, which Ellis describes as *Sound Therapy*.

Soundbeam" is one example of such technology. It emits an ultrasonic beam of variable range. Movements within the beam generate data interpreted by any MIDI instrument. Essentially, its an invisible, elastic keyboard in space that allows sound to be created without the need for physical contact with any equipment. Originally developed for dancers - giving them a redefined relationship with music - Soundbeam has proved to have dramatic significance in the disability field, because even with profound levels of impairment the most minimal movements can instigate and shape interesting sound effects, trigger rich and exotic aural textures, or perform soaring improvisations. Individuals especially difficult to stimulate can benefit from what may for them be a first experience of initiation and control. The core objectives of this presentation are:

- to introduce a new technology which is used in over 1000 special education and adult centres in over twenty countries;
- to explain the evolution of this technology, focusing on the development of The Soundbeam Project as an unusual partnership between professionals in special education, music composition, electronics and psychology;
- to investigate the operation and performance of the equipment;
- to examine, using video and published academic research literature, a continuum of applications, ranging from the basics of cause-and-effect work and 'sound therapy', through to more ambitious creative/performance applications;

EC 306679

- to allow delegates to make an informed evaluation of the system.

INTRODUCTION

The focus of this presentation is a specific item of technology - *Soundbeam* - which (at least in theory) makes the universal medium of music newly accessible, particularly to those who, because of disability, might hitherto have been denied independent creative experience.

The idea of a musical instrument which could be played without any physical contact was first developed by Leon Theremin, the Russian composer whose 'Thereminvox' astounded audiences in the 1920's, and which can be heard on the soundtracks of countless low-budget sci-fi movies. Most people have never heard of the Thereminvox, but nearly everyone has heard one played. In spite of its 'scary monster' associations, the Thereminvox (which is currently enjoying something of a comeback) is intended as a serious musical instrument. Repertoire exists for it, and the performances of Theremin virtuoso Clara Rockwell attest to the instrument's expressive power.

Soundbeam's development was inspired by the Thereminvox. There are, however, two essential differences between the two machines. Firstly, whereas the Theremin creates a fixed playing zone close to the device itself, Soundbeam (designed for dancers) incorporates a variable ranging control which allows the invisible beam to be compressed into a few centimetres or stretched out to cover an entire stage area. In practice this means that the invisible instrument can be varied in size to accommodate the movements that the player wishes to perform, or is capable of performing. The second key difference is that whereas with the Theremin variations of timbre were not available (you were more or less stuck with the scary monster sound), Soundbeam - on its own - produces no sound at all. Instead, the machine functions as an information processor which translates distance and movement data into signals which are understood by electronic instruments, so that any sound which a given instrument will generate can be 'played' with the beam.

Soundbeam works by emitting an invisible beam of high frequency sound (ultrasound) inaudible to human ears. The ultrasonic pulses are reflected back into the device's sensor by interruptions of and movements within the beam. Information about the speed and direction of this movement is translated into a digital code (MIDI) which is understood by a growing proliferation of electronic musical instruments, from relatively simple and inexpensive home keyboards to professional studio-quality synthesisers, samplers and expanders.

The system incorporates three principal control parameters. Variations in *Range* settings allow the length of the beam to be varied between 0.25 and 6 metres. Shorter beams concentrate note information into a relatively small space, a set-up which has proved to be of significant value in special education where player's ability to move expansively may be limited by disability. Longer beams allow a complete performance space to be 'live' with sounds. *Transpose* settings allow semitonal modulation of the scales contained within the beam, useful where the beam is played alongside other electronic or acoustic instruments. *Mode* settings govern the realisation of note information contained in the beam. Each of the Mode presets comprises four variables: the number of notes potentiated (between one and sixty-four), the relationship of those notes to one another (scales, chords and arpeggios), the articulation required to activate the note (the dynamics of the movement in relation to the sensor), and secondary information such as velocity, pitchbend and modulation depth. In addition to the resident Soundbeam 'memories' it is also possible to load a user-defined sequence of notes into the beam. This has the benefit of enabling a considerable degree of compositional exploration without the necessity for a commensurate level of keyboard skill: an idea can be programmed in at the user's pace and then performed in real time with dance or simple movement. Up to four sensors can be attached to the basic system. Thus it is possible to have a three-dimensional playing space, with beams each of different length, each angled in a different plane, and each with its own sound or 'voice'.

SOUND THERAPY

In traditional music therapy, the less the child is able to say something with sound because of a physical or cognitive disability, the heavier becomes the therapist's responsibility for empathy and interpretation . The main focus and engine for the mood and meaning of the music which is happening is on the therapist, and this creative and interpretative role is increasingly shifted away from the child with more profound levels of disability. Consequently, as the liberating potential of musical expression increases, it becomes correspondingly less achievable. This allocation of creative 'power' may have no clinical or therapeutic rationale, it may simply result from what is physically possible. New evidence suggests that Soundbeam can provide answers to this problem.

The experience of *initiation* is central to the success of Soundbeam, especially for individuals with profound disabilities. If ones overall experience of life is essentially passive, it may be difficult to develop any concept of 'selfhood', any idea of oneself as a separate individual. What Soundbeam offers, perhaps for the first time and regardless of the individual's degree of immobility, is the power to *make something happen*. This is the vital experience of "that was me!", which can function as the foundation stone for further learning and interaction. This use of sound as the source of motivation is an extremely simple but crucially important application of the technology; it is impossible to overstate its value.

Work by Dr.Phil Ellis (Ellis '94, '95, '96) at the Institute of Education at the University of Warwick in England has provided us with the first systematic long-term evaluation of Soundbeam's potential for children and adults with disabilities. The beam is positioned so that as soon as the child begins to move an interesting sound is triggered, motivating further movement and, eventually, radically enhanced posture, balance and trunk control. All of this is accomplished in parallel with a strong sense of fun and achievement. For the child, the therapeutic dimension of what is happening is irrelevant. Ellis also discusses some of the broader aesthetic issues connected with his approach:

"There are differences between sound and music, but the term 'music' may now encompass a broader sound spectrum due to the possibilities which have emerged during this century through the increasing use of electricity in music. As early as 1932 Stokowski predicted a time when musicians would be able to compose directly into TONE, not on paper. In other words we would be working directly with sound itself rather than with the symbols used to represent the results of imagined combinations of sound. Furthermore, through sound synthesis electricity has made it possible to discover and create sounds which have never before been heard, and which could not be created any other way. In addition, we can simulate... a range of acoustic environments - concert halls, rooms, cathedrals or other large spaces for example, or may create acoustic environments which are impossible to encounter in the external physical world. This aural richness and variety provides the internal motivation which lies at the heart of this approach. In addition the technology also provides physical access for the disabled.

....Sound itself is the medium of interchange... This approach contrasts with traditional models of music therapy, with its emphasis on 'treatment', direct intervention and imposition of external stimuli determined by an outside agent. Even where a music therapist may claim to be 'responding' to a patient's music, this is a personal response on the part of the therapist. Often the therapist uses, or moves towards, a traditionally based musical language comprised of melody, harmony and rhythm, so limiting the soundscape and genre of 'musical' discourse. The 'patient' or 'client' is viewed in a clinical way, with a condition which needs to be treated or ameliorated. There are clearly defined goals with these treatments, with success measured according to how effective the treatment has been in terms of the clinical or medical condition. The *modus operandi* of these approaches is essentially from the outside -in, with an emphasis on clinical intervention rather than independent learning.

In Sound Therapy a different, contrasting approach is taken. Whilst progression and development remain a key focus, the essence lies in the internal motivation of the child, in working from the inside - out. This internal motivation is produced through the use of sound within a carefully controlled environment. At

all times the child is given the opportunity to independently take control of the situation as far as possible. Certain aspects are controlled externally - notably the sonic environment - but the essence lies in allowing the child freedom to act as she or he chooses within available parameters which remain as open as possible. In this way, learning occurs incidentally. As a result we can see progression and development in a variety of ways across a range of disabilities. Such progression is not prescribed in advance, but happens as a natural and additional part of activity, all stemming from the internal motivation of the child - a phenomenon referred to as *aesthetic resonation.* This is made possible through a particular use of sound as the primary medium of interaction, and through giving access through the use of technology, so enabling even profoundly handicapped children the opportunity for expression and control - in other words the encounter with and development of communication skills - through sound."

From systematic analysis of videotape session records, Dr. Ellis has identified nine criteria of progression and development:

1. from involuntary to voluntary
2. from accidental to intended
3. from indifference to interest
4. from confined to expressive
5. from random to purposeful
6. from gross to fine
7. from exploratory to preconceived
8. from isolated to integrated
9. from solitary to individual

He notes that even profoundly disabled children respond to Sound Therapy by:

- performing, listening, verbalising, 'composing' with sound;
- often showing 'aesthetic resonance' through most telling facial expressions;
- being actively involved for extended periods of time;
- revealing an ability for concentration not apparent elsewhere;
- beginning to discover, explore, give expression to and communicate their own feelings;
- making significant physical responses - movements and gestures which hitherto have not been seen, or have not previously been made independently.

> "...in addition, a change has been seen in behaviour patterns beyond the immediate environment of Sound Therapy. Some children are now more self-aware and are interacting...Other children show more tolerance and a growing awareness of other people, moving towards interpersonal skills."

In these early explorations of the beam the therapist has two important jobs. Firstly, to select from the (probably hundreds) of available sounds, interesting and motivating ones which will stimulate interest (this is particularly important where cheaper synthesisers are used as these will contain many uninteresting and unpleasant sounds), and to sustain engagement by changing synthesiser voices and, possibly, Soundbeam modes so that musical output does not become tedious; and secondly, to observe and estimate the various axes and degrees of physical movement so that the 'invisible sounds' are optimally positioned in relation to the child's body.

> ".... few of these children have the necessary physical co-ordination or control necessary for traditional musical performance. However, we can legitimately shift the view away from purely traditional musical qualities towards the new and developing musical aesthetic, one which has in part been enabled through the introduction of electricity to musical activity. In so doing many musical doors can be opened and we can all enjoy being expressive with sound... Many of these techniques can be made easily accessible to virtually all children through technology."

Kathryn Russell (Russell '96), working in Australia has also identified a number of areas of

development with the special students she involves with Soundbeam, including:

- AESTHETIC AWARENESS (includes the capacity to make choices and judgements as to what sounds or movements to select and manipulate)
- IMAGINATION (anticipating sounds and movements well ahead of time - perhaps in the week between classes)
- LISTENING SKILLS (listening to the effects of moving or standing still)
- CHOICE-MAKING SKILLS (will I choose Soundbeam? which sound will I choose? which part of my body will I move? where will I move?)
- CONCEPTUAL SKILLS (especially 'beginning, middle and end' - how will I begin? what will I do then? how will I make an ending? specific musical concepts such as high, low, fast, slow, variation; the concepts of linkage - words with movement, feeling with tone colour...)
- MOTOR PLANNING SKILLS (which movement will I make now to produce...?)
- REFLECTIVE COGNITION (how did I feel about the piece I just invented? what could I have done differently? What did it remind me of?)
- MEMORY SKILLS (can I remember which sound I liked last time? do I want to use it again?)
- SPATIAL ORIENTATION (where in space is that dog barking sound?)
- LANGUAGE SKILLS (describing what I did and how I felt, giving a title to my work).
- EXPLORING A HYPOTHESIS (I remember that if I move this way, that sound happens. If I move the same way, will I get the same sound?)
- SOCIAL SKILLS (waiting for a solo turn, sharing the beam to produce joint improvisations).
- CONFIDENCE (this is something that I *can* do).

> "Bearing in mind the extremely short attention span of many children with special needs, students have demonstrated a remarkable capacity to focus on their improvisations for long periods of time, thought previously to be beyond their abilities.....Those using Soundbeam for music education have discovered that children who are able to take control of their music making develop not only expressive and practical movement capabilities, but also create improvisatory music which has relevance and validity"

FROM THERAPY TO PERFORMANCE

Russel's findings, like those of Dr. Ellis, provide a systematic assessment of physical and affective responses, giving quantifiable data about Soundbeam's clinical possibilities. In parallel with this approach, many projects in the disability field are exploring the creative performance-based paths opened up by this new technology. At 'The Ark' in Bracknell, a multi-arts project for people with learning difficulties, dancer Penny Sanderson and musician David Jackson's workshops always involve a narrative theme, and include live music, dance and drama, providing an excellent example of the way in which technology can be used to complement and enhance a successful established activity (rather than a sterile 'technology-led' approach) in a way which allows participants a fuller involvement. The sounds and tunes triggered by the students' movements in the beam have a place in the story and are tailored to the personalities and moods of the individual students. Dinosaurs, waterfalls, butterflies, monsters, princesses, lions, explosions - this aural dimension is all controlled and modulated by the students', and this in turn reinforces and remotivates their involvement.

Fransisco Borges da Souza, a music therapist working in Portugal, has formed a rock band with Soundbeam as one of the key instruments. The astounding expressiveness of the disabled Soundbeam player clearly reveals a talent that has been unlocked.

Special schools in England are now starting to collaborate with so-called 'mainstream' schools on music projects involving Soundbeam. As the children are able to learn and perform on an equal basis, the disabled/non-disabled barriers can be broken down. English special schools are often isolated and the arts can clearly give a strong focus for integration where this can be enabled by appropriate technology.

Meldreth Manor School in Hertfordshire and the Ormerod School in Oxford are outstanding examples.

THE SOUNDBEAM PROJECT

We are taught that 'serious' musicianship demands years of dedication. So what are we to make of devices which allow musical expression to happen almost immediately? How can we asses the musical validity of what we hear? With conventional instruments, designed for those with average or above-average physical, mental and sensory functioning, the time gap between musical imagination and musical realisation takes years to develop. Good technology radically shortens this gap. It extends the limits of selected-scale or percussion based work, and it asks the player to learn not the technical skills of the traditional instrumentalist but the freedoms and disciplines of improvisation. This kind of music is difficult to evaluate because there are no right or wrong ways of playing it - no performance of a piece of music played with Soundbeam will ever sound the same twice; but it is possible to assess the extent to which the student enjoys it and gets a feeling of achievement from it, and some of the preliminary research reviewed here indicates strongly that the attainment of significant milestones in the physical, cognitive and social development of individuals with a range of disabilities can be radically assisted by the use of such technology.

REFERENCES

APPLEYARD, ANNE: ''Magic' Soundbeam frees children from their silent prison'. *Independent on Sunday*, 24th August 1997, p.8.

BARR, EMILY: 'Sounds of Movement' in *The Guardian*, 4.2.97

CHESNER, ANNA: 'Dramatherapy for People with Learning Disabilities - A World of Difference. P.44; p.58.

ELLIS, PHIL: 'Sound Therapy' in *Special Children*, Nov/Dec 1995, pp 36-39.

ELLIS, PHIL: 'Incidental Music' video with booklet 'Sound Therapy, The Music of

Sound', The Soundbeam Project, 1996.

ELLIS, PHIL: 'Special Sounds for Special Needs: Towards the Development of a Sound Therapy'. *International Society for Music Education* 1994 Conference proceedings.

ELLIS, PHIL: 'Developing Abilities in Children with Special Needs - A New Approach' in *Children and Society*, 1995, 9:4, pp. 64-79.

ELLIS, PHIL: 'Sound Therapy' in *Primary Music Today*, issue 3, September 1995.

ELLIS, PHIL: 'Incidental Music: a case study in the development of sound therapy' *British Journal of Music Education*. (1995), 12, pp. 59-70

ELLIS, PHIL: 'The Music of Sound: a new approach for children with severe and profound and multiple learning difficulties'. *British Journal of Music Education*, 1997, 14:2, pp. 173-186.

ELLIS, PHIL: 'Soundbeam !' in *Music in the Curriculum*, issue 31, 1996, p.8.

JACKSON, DAVID: 'Ark in Performance' (video interview transcript). Soundbeam Project 1992.

JACKSON, DAVID: 'Soundbeam Artistry' creative user manual, Soundbeam Project 1995.

JACKSON, DAVID: 'More than the Music' in *Special Children*, Nov/Dec 1994, pp 31-32.

OCKELFORD, ADAM: 'Music and visually impaired children', RNIB 1993

PEGGIE, ANDREW; 'Soundbeams breach symphony hall' in *Sounding Board*, Spring 1994, pp12-14.

RICKSON, DAPHNE: 'Soundbeam'. New Zealand Conference on Technology for People with Special Needs. http://nz.com/webnz/ability/csn_papers:html

RUSSELL, KATHRYN: 'Imagining the Music, Exploring the Movement: Soundbeam in the Sunshine State'. *Queensland Journal of Music Education*, 4,1, 1996. Pp 41-48.

RUSSELL, KATHRYN and RUSSELL, NEIL: ' "See that? That's magic": New Sounds and Sights in Music Movement Improvisation - the Soundbeam Experience. ASME, Brisbane, July 1997.

ROBERTS, JIM: 'Breaking the Sound Barrier' in *Ninety-Five Percent*, Summer 1995, pp. 18-19.

SWINGLER, TIM: 'Unlocking Musicality: using Soundbeam as a new key to eloquence' in Krout, R. : *Integrating Technology*, Music Therapy Perspectives, NAMT, 1994, 12, 1, pp. 4-5.

SWINGLER, TIM: 'Dinosaurs and Butterflies' in *Extending Horizons*, National Council for Educational Technology, 1995.

SWINGLER, TIM: 'Creativity as Therapy using Soundbeam' National Association of Paediatric Occupational Therapy Newsletter, Spring 1996, pp. 31-33.

SWINGLER, TIM: 'Movement into Music' *YES* Magazine, issue 11, pp 16-17

SWINGLER, TIM: 'Liberation or Limitation?' in *Extending Horizons* op. cit.

SWINGLER, TIM: 'The drum is not the only weapon' in *Nordic Journal of Music Therapy*, 1995, 4 (2), pp. 103 - 107.

SWINGLER, TIM: 'Choreography as Composition - Movement into Music: using Soundbeam as a new key to creative eloquence'. Proceedings of the Biennial World Conference, ISME, 1994,

SWINGLER, TIM: 'La Coreografía como composicíon el movimiento en la música: la utilización del Soundbeam como un nuevo acceso a la elocuencia creativa' in Violeta Hemsy de Gainza (Editor) *La Transformación de la Educación Musical a las puertas del Siglo XXI.* ISME /Editorial Guadalupe 1997. Pp. 75-82.

TODD, JULIA: An Investigation into the Possibilities of the EMS Soundbeam as a Tool for contemporary Choreography. BA Dissertation, Laban Centre for Movement and Dance, 1993.

WILLIAMS, EDWARD: 'Introduction to vibroacoustic therapy'. Soundbeam Project 1997.

WILSON-HINDS, ROGER: An objective appreciation of Soundbeam. Unpublished field trial.

Soundbeam Project web site: http://www.soundbeam.co.uk

BIOGRAPHICAL DETAILS -*TIM SWINGLER BSc (hons), Cert Ed, DSA*

Tim Swingler trained in social psychology and as a teacher, and has also studies criminology in Germany and the Netherlands. He became involved in community music in Bristol, England in 1980 and moved to Norfolk as development co-ordinator for the Norwich Community Music Project, organising and running workshops in prisons, schools, with pre-school, youth and elderly groups, and a range of 'special needs' organisations. He is one of the founding members of the National Community Music Association in the UK. He assisted with setting up Soundbeam Project in 1990, and has given papers on Soundbeam at conferences in the United States, Canada, Denmark, Estonia, Australia, New Zealand, Russia, France, Spain, Ireland, Italy and the Netherlands. As well as the Soundbeam Project's own training and workshop programme, in April 1995, in collaboration with Paul Wright of Sonic Arts Network, he organised *Soundability*, a residential 5-day training conference covering all aspects of music technology for special needs. *Soundability* is becoming recognised as a new model for community arts and music education. He lives in Norfolk, England with his wife, son and four daughters. Tim Swingler is a member od the International Society for Music Education (ISME) Commission on Community Music Activity.